Field Notes: A Journal of Collegiate Anthropology

Volume 2 Article 6

2010

Intrasite Feature Analysis of the Crescent Bay Hunt Club Site

James Moss

Intrasite Feature Analysis of the Crescent Bay Hunt Club Site

James Moss

The Crescent Bay Hunt Club Site (47JE904) is a Developmental Oneota site located on Lake Koshkonong in southeast Wisconsin. This site was occupied circa A.D. 1200 to 1400. Feature remains representing two wigwam style structures and at least one post in trench longhouse structure have been excavated at the site. Using 20 calibrated radio carbon dates ranging from A.D. 1000 to 1500, a Geographic Information System (GIS) is employed to conduct an analysis of the two structure types. It is concluded that despite the range of dates, there is no reason to believe a diachronic pattern is exhibited.

Site Description

The Crescent Bay Hunt Club Site (47JE904) is a Developmental Horizon Oneota site located on the northwest shore of Lake Koshkonong in southeast Wisconsin. The majority of the radiocarbon dates for site occupation fall between cal A.D. 1200 to 1400. The first published report describes a village surrounded by remnants of Native American maize fields (Stout and Skavlem 1908). In 1968, the University of Wisconsin-Madison excavated a portion of the site over the course of a weekend as part of a fall field session. Under the direction of David Baerreis, an Oneota house and several nearby features were uncovered (Gibbon 1968). In 1995, University of Wisconsin-Milwaukee (UWM) surveyed a small strip of cultivated field in an area thought to coincide with the 1968 excavation (Hanson 1996). Since 1998, a sustained program of survey and excavation has been maintained at the site by UW-Milwaukee, under the direction of Robert Jeske (Gaff 1998; Jeske 2000, 2001; Jeske, et al. 2003).

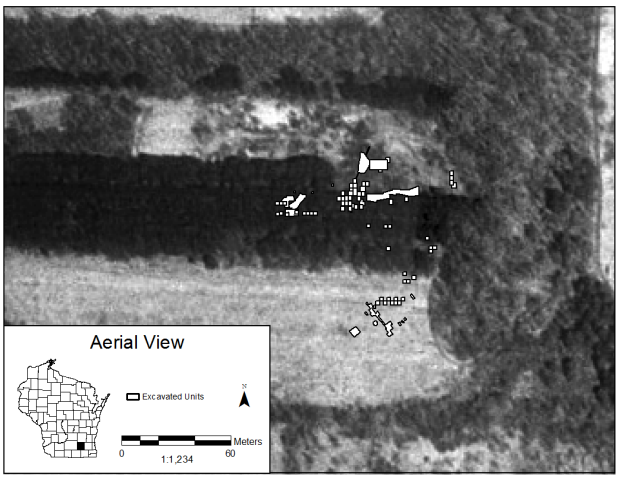

Figure 1: Arial view with position of excavation units (photo circa 1996).

The 1998 UWM field school excavation goals were to locate the 1968 excavations and define site boundaries. The crew re-excavated portions of the house and two of the associated features west of the house. It was these 1998 excavations that

were used in the GIS. The 1968 features not within the 1998 block were added to the GIS, but they are not identified by type, since no profiles were recorded. Shovel probe data from 1995, 1998 and 2000 indicate that the site measures approximately 160 meters north-south by 140 meters east-west. These dimensions were estimated at 22,400 m^2 (5.1 acres) by Jeske (2001:6). Site boundaries were estimated in the GIS by encompassing the positive shovel probes that define the site, providing a total minimum area of 29,300 m^2 (7.2 acres) with a circumference of approximately 730 m.

The site occupies the crest of a ridge that rises eight meters above Lake Koshkonong, and runs along the western shore of Crescent Bay, effectively creating a boundary to the east. Several factors have affected feature preservation at the site. The entire area has been in cultivation to varying degrees since the mid-19th century and all living floors have disappeared under the plow, leaving only subsurface features. The central portion of the site has been partially protected from cultivation by a 300 x 150 m strip of pine trees (Figure 1) that are estimated to have been planted sometime between 1920 and 1940 (Jeske, et al. 2003:20). On the other hand, cultural disturbance and bioturbation associated with pine silviculture has also impacted the cultural materials within the planted pine field. The northern and southern extents of the site were plowed regularly until circa A.D. 2000, resulting in significant downslope erosion of topsoil to the north, east and south (Figure 2).

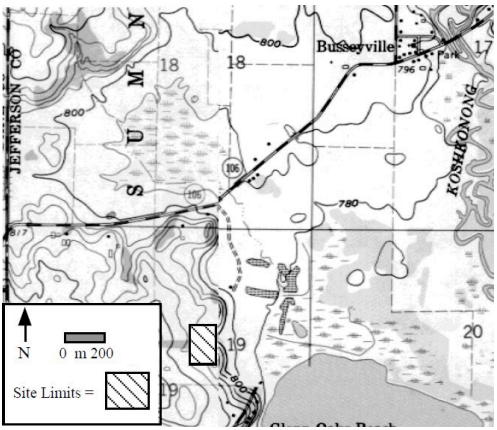

Figure 2: Location of Crescent Bay Hunt Club site (Jeske 2001:Figure 2.1).

Methods

The initial goal of the project was to convert four 23.5" x 32" hand drawn pencil and paper site maps into a computerized geographic information system (GIS). The large site maps were scanned to PDF files, which were then projected using ESRI's ArcGIS 9.2. The four maps were geo-referenced to the site coordinate system used by the hand drawn maps. The site was then geo-referenced to a real world coordinate system (NAD 1983 UTM zone 16), so that topological maps and aerial photos from the United States Geologic Survey (USGS) could be overlain.

Three spatial layers, or shapefiles, were created in a personal geo-database. Features and units were entered as polygon layers while the shovel probes were entered as points. Using the edit drawing tool, the GIS features were digitized into shapefiles by tracing over the paper and pencil PDFs. When a feature is

created within the shapefile in this way, its circumference and area are automatically calculated. It is possible that greater detail could be obtained by importing the individual unit planview sketches into the GIS. It was from these sketches that the site maps were created, however, since most features do not have sharply defined boundaries in reality, this method was deemed impractical and unnecessary. Data fields were added for unit and feature number as well as for feature type.

Archaeological feature types were then assigned to each digitized feature based upon morphological characteristics. Larger pit features had previously been designated as storage pits, multi-use pits, maize storage pits, hearths, wild rice threshing pits, basins and shallow basins (Jeske, et al. 2003; Mollet and Jeske 2001). These seven descriptive terms were reduced to three morphological types: cylindrical pits, basins and shallow basins. Cylindrical pits are defined as being circular in plan view, and having straight-walls and a flat-floor in profile. In plan view, basins tend to be more irregular, but are defined by their parabola-like profile. Shallow basins are defined as relatively shallow versions of the basin. By comparison, eight profile types are described for Tremaine, a Classic Oneota site located on the Mississippi River near Lacrosse, WI (O'Gorman 1995:92). Crescent Bay also lacks undercut, or bell shaped pits described at Walker-Hooper, a Developmental Oneota site located along the Grand River in Green Lake County, WI (Gibbon 1969:63). Four other feature types were designated using functional terminology. Hearths are defined as shallow areas of burned earth, charcoal and ash, distinguished from post-depositional ash and charcoal. Burials are defined as a pit containing human remains, which may also have a morphological designation. Postholes are defined as tapered, conical features that are circular to oblong in cross section, while wall trenches are defined as linear features with flat floors and straight walls with post holes piercing into the subsoil below. Table 1 gives the total number of each feature type designated in this study. There are eightfeatures in the GIS that have been designated as unidentified because they were left unexcavated due to time constraints.

Basin	35
Burial	6
Hearth	4
Postmold	381
Shallow basin	13
Wall trench	5
Cylindrical pit	26
Indeterminate	8

Table 1: Feature type counts recorded in GIS.

Analysis

This use of the GIS should be considered a spatial summarization, rather than spatial analysis, since the goal is pattern recognition (Wheatley and Gillings 2002). Geographic Information Systems are useful tools in performing this type of spatial summary because they allow the user to quickly filter out feature

types, labels and unit boundaries, which may make patterns more apparent. However, because the human brain is especially good at recognizing patterns, it tends to do so even when there is no real world pattern, and user discretion must be maintained in this regard. Pattern recognition is especially dangerous if the viewer ignores or forgets the limits of the excavation units. Distribution patterns often occur as a function of what has been excavated, rather than the actual archaeological record.

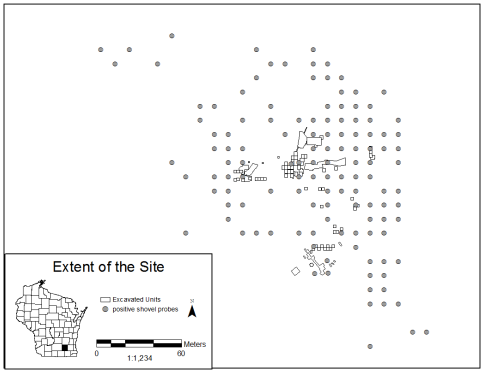

Figure 3: Site as defined by positive shovel probes.

After the features and units were digitized in the GIS, a schematic of the positive shovel probes was layered over the site map in order to give a sense of the extent of the site, as well as the proportion that has been excavated (Figure 3). Several open spaces appear to be present between the positive probes. These apparent open spaces so far seem to represent actual voids in the cultural remains, as there are few archaeological features found within the excavated units in these portions of the site.

There are three main concentrations of features that have been excavated. A square house, denoted by concentric rings of post holes, occupies the southeast extent of the site. A second similar house sits on the western portion of the site. The third concentration includes a rectangular enclosure in the central portion of the site. The southeast house was originally discovered in 1968, and portions of it were re-excavated in 1998 (Figures 4 and 5). Several unidentified pit features are in the vicinity; however, since no site map exists from the 1968 excavations, this portion of the site has been reconstructed from Baerreis's notes and the placement of these units is tentative. As mapped they are over 6m from the house. There are four radio carbon dates that were obtained from the 1968 excavations (Bender, et al. 1970). Table 2 lists the 20 radio carbon dates analyzed to date. The four 1968 dates center around cal. A.D 1250, though these dates are likely early, because of

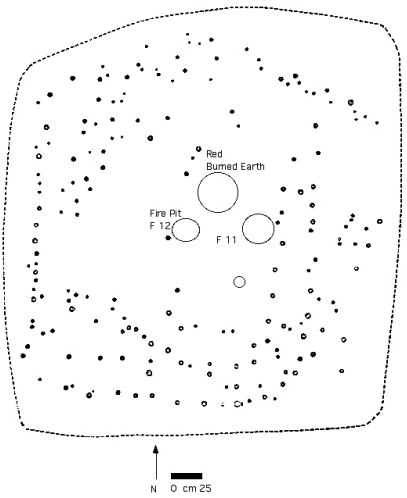

Figure 4: 1968 map of southeast house (Gibbon 1968).

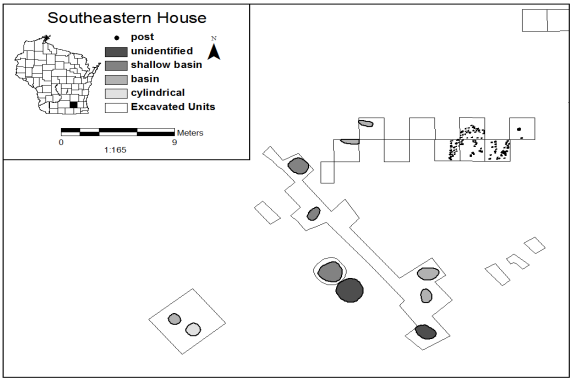

Figure 5:1998 block excavations. Unidentified features are from 1968 excavations (after Gaff 1998:Figure 7).

the problem of old wood (Jeske 2001:10).

The western house post hole pattern is very similar to that of the southeastern house (Figure 6). Both houses contained hearths. These structures are interpreted to be wigwam style houses, with the additional rows of posts representing interior benches, possibly for sleeping (Gibbon 1968:88-93; Skinner 1921). Similar post hole patterns were found at Carcajou Point, though only small portions of these structures were excavated (Hall 1962).

The two Crescent Bay wigwam structures appear to be very similar in construction to the Menomini winter lodges described by Skinner (1921:88-93).

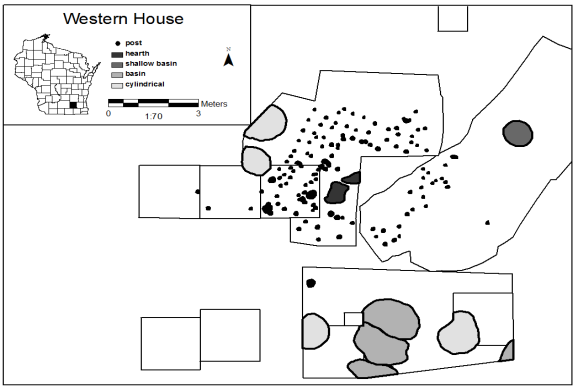

Figure 6: Western house.

These types of houses were common throughout the Woodlands of Eastern North America (Skinner 1921:85-86). Construction of these structures starts with a rectangular pattern of saplings placed into the ground. The poles are then bent and tied together to form a domed house, with benches added on the interior (Skinner 1921:88-93). This matches very well with the pattern seen at Crescent Bay. The frames are then covered with mats of cattail flags, or birch or cedar bark. For bark construction, McKusick (1973:41) describes a double wall of posts, where the outer "wall" is used to hold the bark in place.

As with the southeastern house, there are several exterior features associated with the western house. To the northwest there are two cylindrical pits within a meter of the outer line of post holes. These are the most likely to be directly associated with occupation of the structure because of their close proximity to

the exterior wall. The single radio carbon date from feature F06-63 was obtained from the residue from a Winnebago Trailed ceramic vessel and reads A.D. 1224 to 1280 at one sigma. To the south there are two more cylindrical pits within 3 meters of the projected corner of the house, and three side by side by side basin features. Five radio carbon dates were taken from a variety of vessels found in Feature F04-15. These dates range from A.D. 1051 through A.D. 1434 at the one sigma level. A single date was obtained from the residue of a Grand River Trailed vessel and ranges from A.D. 1042 to 1159 at one sigma. The range of radiocarbon dates obtained from these surrounding features seems to indicate that this area was reused throughout an extended period of site occupation, though it is very doubtful that the wigwam was occupied for the entire duration.

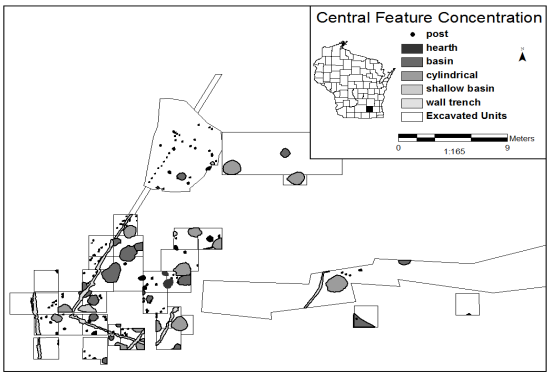

Figure 7: Distribution of the central feature concentration.

The third concentration of features contains examples from of all of the feature classes and represents a dense area of activity (Feature 7). The GIS has been especially helpful in analyzing feature distribution in this area. Several wall trenches appear to run parallel to each other, as well as what appears to be an end of a rectangular enclosure. All of the wall trenches contain post holes occurring every 20 to 30 cm which are only visible in profile (Figure 8). The wall trenches themselves extend only about 5 to 10 cm below the plow zone. The northern end of this concentration extends beyond the protection of the pine trees, and was exposed for a longer period of time to the affects of plowing and erosion. It is likely that the wall trenches extended further north, but only the post holes remain.

Figure 8: Top is north-south trench. Bottom is east-west trench.

The GIS was helpful in

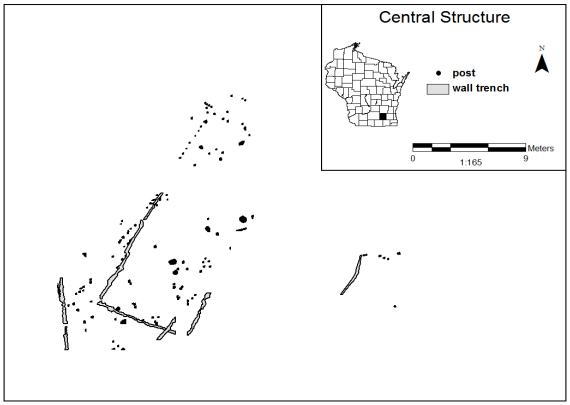

Figure 9:Distribution of wall trenches and postmolds in the central feature concentration.

filtering out the palimpsest effect of the paper and pencil map. Until recently, the wall trenches had been interpreted to be a palisade wall enclosure, possibly protecting a garden or food processing area from animals. By selecting the value field for feature type, each type of feature can be displayed or turned off. Displaying the wall trenches and post holes within the GIS, while filtering out the other feature types, reveals what appears to be a rectangular structure that was likely rebuilt at least once (Figure 9). If the assumption that the line of post holes to the north is an extension of the western parallel wall trench is correct, and taking the line of post holes that form a perpendicular 90 degree angle as the northern end, the resulting enclosure would be approximately 7.5 x 18.5 m. The floor area would be similar in size to ethnographically and archaeologically (McKusick 1973; O'Gorman 1996; Skinner 1921) described longhouses. The post holes extending below the wall trench exhibit two distinct patterns when viewed in profile. The wall trenches running roughly north-south contain longer, narrow post holes, and the wall trench running roughly east-west contain shorter and wider post hole profiles (Figure 8). The interpretation is that the north-south walls were formed by smaller branches, bent to arch over the centerline of the structure, while the east-west walls contained stouter posts, forming a vertical wall, so that the resulting structure resembled a Quonset hut.

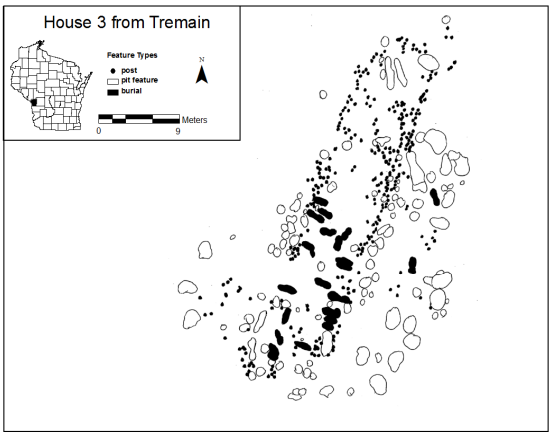

Figure 10: Redrawn from O'Gorman (O'Gorman 1996:Figure 8).

The Tremaine site (47LC95) is a Classic Horizon Oneota site located on the

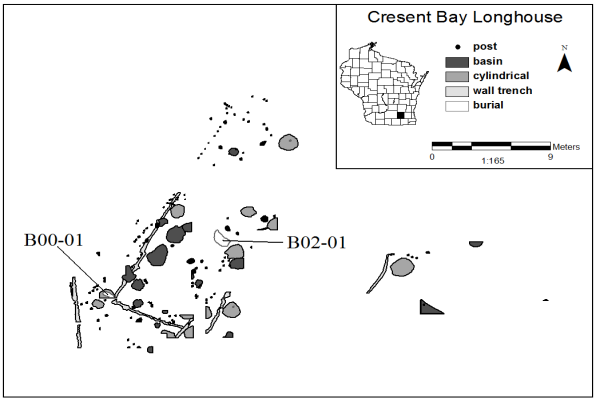

Figure 11: Crescent Bay Longhouse.

Mississippi River, just north of Lacrosse, Wisconsin, occupied A.D. 1400 to 1500 (O'Gorman 1996:199). The Tremaine site contains seven longhouses whose dimensions are 7.4 to 8.5 m wide and 25 to 65 m in length (O'Gorman 1996:81). The Crescent Bay enclosure falls well within this range. Beyond the lack of wall trenches, the main difference is that the Tremaine longhouses have rounded ends, whereas the Crescent Bay structure has squared ends.

One distinct feature at Tremaine are the burials that were placed under the floor of the houses. Most of the bodies were placed perpendicular to the axis of the house, with the heads pointing toward the centerline (Figure 10). The Crescent Bay enclosure has two undisturbed burials closely associated with it (Figure 11). The first burial (B02-01, center of Figure 11) is an adult male that is semi-flexed, holding both a child and an infant. All three bodies are orientated in a northwest-southeast direction, with their heads pointing towards the northwest, perpendicular to the centerline of the structure. The second burial is a single adult male that lies outside of the outline of the enclosure, but falls within what appears to be a second structure that may have been built over the first (or vice versa). This burial lies perpendicular to the centerline of the hypothetical second structure, however the head in this burial points west, away from the hypothesized centerline. The rest of the features associated with the Crescent Bay structure produce a pattern very similar to that found at Tremaine: various pit features both within the structure, and closely associated outside the structure (Figure11). Additionally, the Crescent Bay cylindrical pits and basins are morphologically similar to the Tremanine features, though more nuanced types were identified at Tremain (O'Gorman 1996:213).

It is still possible that the Crescent Bay structure is appearing as a function of excavation, as there are significant voids in the central and northern areas (Figure 7). But for the time being, it may be useful to interpret the distribution as such, and continue to look to see if there are other parallels elsewhere in the archaeological record.

As stated, the two wigwam structures identified at Crescent Bay resemble other archaeological and ethnographic examples, but there are no matches to be found for the longhouse structure. Post-in-trench wall structures have been observed at Carcajou Point and the Zimmerman site, in Illinois (Brown 1961;

Hall 1962). However, both of the rectangular structures are much shorter than the example at Crescent Bay. Hall describes the Carcajou Point structure (15 by 20 ft), as a gabled bark summer house (Hall 1962:17). Hall does not describe the wall trenches in profile, so it is not known if the posts resemble either pattern seen at Crescent Bay (Robert Hall, personal communication, 2008). It is noted that post-in-trench wall construction at Carcajou Point resembles the wall construction of the semi-subterranean houses at Aztalan and other Mississippian sites (Hall 1962:20).

Skinner's (1921) ethnography also describes the construction and use of longhouses, however at that time they were exclusively used as ceremonial structures, though it was remembered when they had been used as multifamily homes. When used as houses, the interior had been quartered, or sectioned (Skinner 1921:99-100). By bisecting, and dividing the longhouses at Tremaine into sections, O'Gorman (1996) was able to demonstrate that an uneven feature volume existed between these areas, and argued for uneven resource distribution. McKusick (1973:39) and Skinner (1921:96) both cite that because the longhouses were harder to heat in winter, they were only used as warm weather, seasonal dwellings (though the Iroquois of New York and Canada lived in these types of structures year round (McKusick 1973:39; Skinner 1921:87). Alternatively, Hollinger (1995) proposes that smaller structures may represent an earlier (Emergent and Developmental) patrilineal post marital-residence pattern and that larger structures represent the Classic Oneota period, during which a matrilineal residence pattern was practiced. This hypothesis better explains what is traditionally held as the Oneota pattern, where smaller house structures are associated with Emergent and Developmental Oneota sites in Wisconsin, and larger structures are noted from the Classic Horizon (Hall 1962; Hollinger 1995; Overstreet 1997).

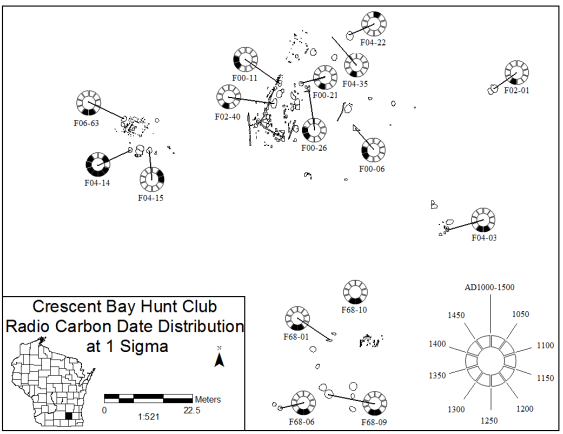

Figure 12: Distribution of radiocarbon dates at Crescent Bay.

The Question then becomes, "Why are there two distinctly different structures at the Crescent Bay Hunt Club Site?" The houses could be the result of a seasonal shift in residence patterns, as ethnographic evidence indicates. A second hypothesis is that the two patterns represent a diachronic shift in post marital residence patterns. A third hypothesis, also modeled after ethnographic

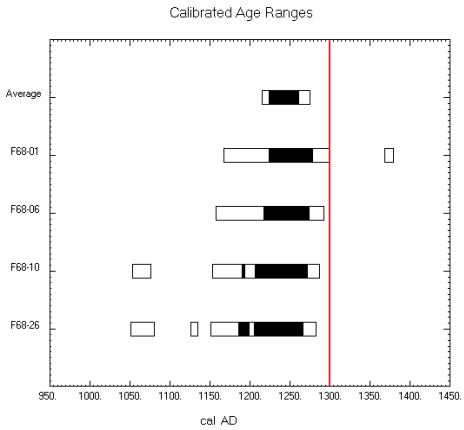

Figure 13: Dates from Wood Charcoal (Struiver and Reimer 1993).

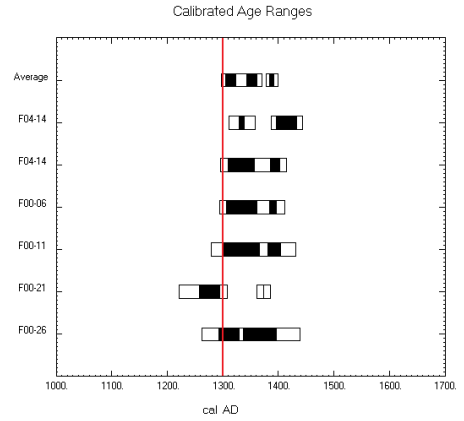

Figure 14: Dates from Annuals (Struiver and Reimer 1993).

evidence, is that the difference is functional, with the longhouse representing a communal structure, rather than a residential one. The spatial distribution of radio carbon dates will be examined in order to test the second hypothesis: that the pattern results from temporal differences.

Discussion

There have been 20 radiocarbon dates (table 2) analyzed to date from the Crescent Bay site. The dates, read uncritically at the two sigma level, span roughly from A.D. 1000 to 1500. These dates span Emergent, Developmental and Classic Oneota horizons; however, inspection of the probability estimates demonstrate that the main occupation of the site falls between A.D. 1200 to 1400. By dividing the radio-carbon date ranges at the 1 sigma level into 50 year blocks, the distribution of the dates can be spatially displayed as if they were faces of a clock, with the earliest dates starting at 12:01 and the latest dates ending at 11:59. Keeping in mind that these date ranges represent a 68% probability, an intra-site pattern does emerge (Figure 12).

The dates from the southern portion of the site range from A.D 1200 to 1300. These dates were obtained from wood charcoal, and possible skew early because of the problem of dating old wood (Jeske 2001). Feature F68-10 has not been relocated, but we know it was near the excavated house. The dates are only indirectly associated with the southeastern structure. The dates from the southeastern block excavations are matched by a single date associated with the northwest wigwam, dated at A.D. 1200 to 1300. The two dates from the eastern part of the site also fall within the A.D 1200 to 1300 time range.

The central portion of the site dates a little later, from A.D. 1250 to 1400, with a single anomalous date of A.D. 1000 to 1050 from a Grand River Trailed vessel found in feature F04-22. The central longhouse does appear to have been a later occupation, which supports the hypothesis for a diachronic difference in house types stemming from a shift in post marital residence patterns. However,

feature F04-14 is cause for serious concern. The dates for this feature are derived from five radio-carbon samples that range from A.D. 1050 to 1450.

When we take into account the overall distribution of dates, it is clear that the material sampled has an effect on our interpretations. The four wood charcoal dates cluster around A.D. 1245, their 2δ pooled range being A.D. 1215 to 1275 (Figure 13). The six maize/nut annual dates cluster around A.D. 1350, their 2δ pooled range being A.D. 1298 to 1400 (Figure 14). The remaining 10 ceramic residue dates span a wide range of dates, but their 2δ pooled range being A.D. 1225 to 1270 (Figure 15). Only one of the 20 dates (F04-22) falls outside of the pooled 2δ average of A.D. 1258 to 1277. Removing this date as an outlier, the resulting pooled 2δ average becomes A.D. 1267 to 1282 and the remaining 19 dates all intercept at a 99% probability (Figure 16). This suggests that the resulting dates are not significantly different, and that there is no reason to expect an extended occupation at the site, which would allow for a shift from patrilineal to matrilineal residence patterns. Early and late dates are more the function of the material type being analyzed, rather than a function of diachronic site usage. We expect the wood charcoal dates to be earlier than the rest, and they are. The mean food residue dates do average earlier than annual plant dates, but have a considerable range, and are statistically the same.

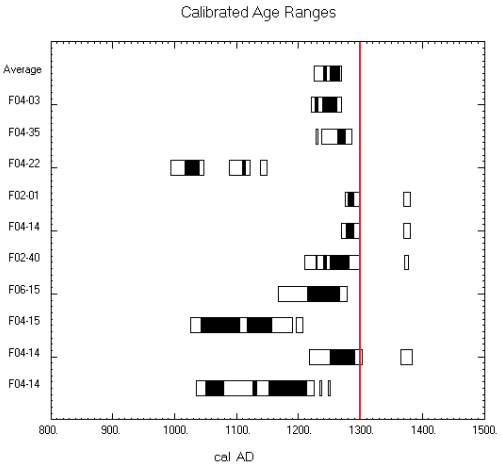

Figure 15: Dates from Food Residue (Struiver and Reimer 1993).

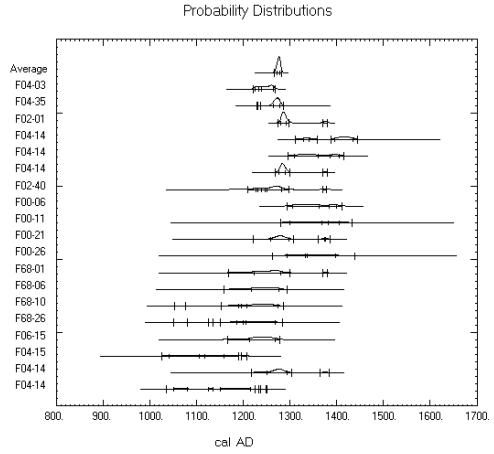

Figure 16: 19 of the 20 Crescent Bay Radiocarbon Dates at 99% Probability (Struiver and Reimer 1993).

Returning to our spatial distribution we cannot conclude that the two house types are the result of a diachronic pattern of structure types, thus invalidating the hypothesis that the two types of house structures represent a temporal shift in post marital residence patterns. Further dating using a combination of food residues and annuals from each of the areas may allow us to refine the chronology within the site.

Conclusion

The Crescent Bay Hunt Club site appears to contain two distinct settlement patterns. The question is whether these two patterns are seasonal, functional, or temporal in nature. One obvious obstruction to solving this question, is the palimpsest that occurs in the central longhouse area. With multiple wall trenches, it appears that there were several rebuilding episodes. Feature trench F00-42 cuts through basin F00-17, which contains several ceramic styles: Busseyville Grooved, Crescent Bay Punctate and Unclassified Oneota. The only conclusion about the relative age of the longhouse we can draw from this stratagraphic data is that this particular structure was built after the site had been occupied long enough for a basin to be dug and filled in.

The palimpsest problem also applies to the radiocarbon dates. From the 20 dates that we have, it appears that the site was utilized over the span of several hundred years, with the mode being between A.D. 1200 and 1300, which is assumed to be the most intensive period of occupation for the site. At this point we cannot demonstrate that the two different structure types represent a temporal shift in post marital residence patterns.

The next step will be to test whether there is a significant difference in material types found within the pit features associated with each house type. If the house types represent a seasonal shift in residence patterns, we would expect to see a difference in floral and faunal remains between the two. If the house types represent functional differences, then we would expect to see significant differences in other material remains within the associated features.

References Cited

Bender, M. M., R. A. Bryson and D. A. Baerries

1970 University of Wisconsin Radiocarbon Dates VII. Radiocarbon 12:335-345.

Brown, J. A.

1961 The Zimmerman Site: A Report on Excavations at the Grand Village of Kaskaskia, La Salle County, Illinois. Report of Investigations No. 9. Illinois State Museum, Springfield, Illinois.

Gaff, D. G.

1998 Preliminary Investigations at the Crescent Bay Hunt Club, Jefferson County. In The Southeastern Wisconsin Archaeolgoy Program: 1997-1998, edited by R. J. Jeske, pp. 34-75. Report of Investigations No. 130. Uninversity of Wisconsin-Milwaukee, Milwaukee.

Gibbon, G.

1968 Je-244: The Crescent Bay Hunt CLub Site. Notes on file, University of Wisconsin-Milwaukee, Milwaukee.

1969 The Walker-Hooper and Bornick Sites: The Grand River Phase Oneota Sites in Central Wisconsin. Unpublished Ph. D. Thesis, Department of Anthropology, University of Wisconsin-Milwaukee, Milwaukee.

Hall, R. L.
1962 The Archeology of Carcajou Point 2 vols. University of Wisconsin Press, Madison.

Hanson, P.
1996 Jefferson County: Survey of the Crescent Bay Hunt Club Property. In Southeastern Wisconsin Archaeology Representing Region 9: Southeastern Wisconsin Project Report: Wisconsin Regional Archaeology Program June 1995 - June 1996, edited by L. Goldstein, pp. 45-52. Report of Investigations No. 128. University of Wisconsin-Milwaukee, Milwaukee.

Hollinger, R. E.
1995 Residence Patterns and Oneota Cultural Dynamics. In Oneota Archaeology: Past, Present, and Future, edited by W. Green Report 20. Office of the State Archaeologist, The University of Iowa, Iowa City.

Jeske, R. J.
2000 Continuing Investigations at Crescent Bay Hunt Club Site (47-JE-904), Jefferson County. In The Southeastern Wisconsin Report of Investigations, edited by R. J. Jeske. Report of Investigations No. 145. University of Wisconsin-Milwaukee Archaeological Research Laboratory, Milwaukee.

2001 Program in Midwestern Archaeology (Southeastern Wisconsin Archaeology Program): 2000-2001. University of Wisconsin-Milwaukee Archaeological Research Laboratory, Milwaukee.

Jeske, R. J., K. M. Foley-Winkler, T. Dahlen and L. C. Lambert
2003 Continuing Investigations at the Crescent Bay Hunt Club Site (47-JE-904), Jefferson County. In Lake Koshkonong 2002/2003: Archaeological Investigations at Three Sites in Jeffereson County, WIsconsin, edited by R. J. Jeske. Report of Investigations. No. 153 vols. University of Wisconsin-Milwaukee Archaeological Research Laboratory, Milwaukee.

McKusick, M. B.
1973 The Grant Oneota village. Office of State Archaeologist, report; 4; Variation: Report (Iowa. Office of State Archaeologist); 4. University of Iowa, Iowa City.

Mollet, J. and R. J. Jeske
2001 Feature Analysis of the Crescent Bay Hunt Club Site (47-JE-904). In Program in Midwestern Archaeology (Southeastern Wisconsin Archaeology Program): 2000-2001, edited by R. J. Jeske. Report of Investigations No. 148. University of Wisconsin-Milwaukee Archaeological Research Laboratory, Milwaukee.

O'Gorman, J.
1995 The Tremaine Site (47-LC-95). Archaeology Research Series No. 3. Museum Archaeology Program State Historical Society of Wisconsin.

1996 Domestic Economics and Mortuary Practices: A Gendered View of Oneota Social Organization. Unpublished Ph. D. Thesis, Department of Anthropology, University of Wisconsin-Milwaukee, Milwaukee.

Overstreet, D. F.
1997 Oneota Prehistory and History. The Wisconsin Archeologist 78(1-2): 250-297.

Skinner, A. B.
1921 Material culture of the Menomini. Indian notes and monographs no 20. Museum of the American Indian, Heye foundation, New York,.

Stout, A. B. and H. L. Skavlem
1908 The Archaeology of the Lake Koshkonong Region. The Wisconsin Archeologist 7(2):47-102.

Struiver, M. and P. J. Reimer
1993 Extended 14cData Base and Revised Calib 3.0 14c Age Calibration Program. Radiocarbon 35:215-230.

Wheatley, D. and M. Gillings
2002 Spatial technology and archaeology: the archaeological applications of GIS. Taylor & Francis, New York.